

Taxonomic Notes on the Genus *Calicha* MOORE and its Allied New Genus from Japan and Adjacent Countries (Lepidoptera: Geometridae)

Rikio SATO

472-2, Makio, Niigata 950-21

The genus *Calicha* was established by MOORE (1888) for the reception of a new species, *retrahens* MOORE from Darjeeling, India. HAMPSON (1895) sank the genus as a junior synonym of *Boarmia* TREITSCHKE, and later INOUE (1953) restored it for *ornataria* LEECH and its near allies. My close examination of some Asiatic species formerly assigned to *Calicha* and those preestimated by me to be congeneric revealed that they form a compact natural group together with two Japanese species which had previously been placed in *Boarmia*, with the exception of one species which will be transferred to other genus.

In this paper four species of *Calicha* will be redescribed and one new genus *Microcalicha* will be erected to receive three species formerly assigned to *Calicha* or *Boarmia*.

In larval descriptions, the terminology for the setae is based on HINTON's (1946) system. The thoracic and abdominal segments are referred to by the abbreviations T and A, respectively.

Calicha MOORE

Calicha MOORE, 1888: 236; INOUE, 1953: 15; INOUE, 1956: 328; INOUE, 1977: 298. (Type-species: *Calicha retrahens* MOORE, 1888: 236.)

Proboscis short. Palpus slightly upturned, extending slightly beyond front. Male antenna bipectinate, each pectination arising from base of segment, very long, the longest pectination about six times as long as the length of segments; densely ciliate ventrally, unscaled dorsally, with a terminal bristle; a few terminal segments without pectinations. Female antenna simple. In male cluster of spines weakly developed on anterior margin of third abdominal segment. Hind tibia of male with a small hair-pencil. Forewing with a fovea in male; 11-veined; vein R_2 entirely coincident with R_1 ; R_1 free from Sc; sometimes R_1 forming a long narrow areole with R_{3+4} .

Male genitalia (Figs. 27-30). Uncus short, pointed at apex. Tegumen broad. Gnathos well developed with a large tongue-shaped medial plate. Valva broad, slightly narrowed apicad; costa narrowly sclerotized, distal area covered with numerous fine setae forming cucullus; ampulla covered densely with many short spines. Juxta with a pair of slender arms from near base; arms strongly sclerotized, serrated marginally, apices pointed. Aedeagus short, well sclerotized dorsally with a short, pointed or triangular process; cornuti on vesica composed of a small group of spines or absent, according to species.

Female genitalia (Figs. 31-34). Ovipositor relatively short. Sterigma with a small median area lightly sclerotized and with membranous lateral areas. Bursa copulatrix

weakly sclerotized and ribbed posteriorly, weakly or strongly enlarged anteriorly. Ductus seminalis arising from near posterior end of bursa copulatrix. Signum present, represented by transverse process with short spines along anterior margin.

First instar larva (of *ornataria*). Head black. Body greyish black with white area at anterior margin of T1 and medial area on each segment of A1 to A5.

***Calicha retrahens* MOORE**

(Figs. 1–2)

Calicha retrahens MOORE, 1888: 236.

Boarmia retrahens: HAMPSON, 1895: 273.

Forewing dark olive-brown, irrorated with black with a reddish brown streak on inner margin near base; antemedial line ill-defined, slightly excurved; medial line indistinct, excurved outside of cell and bent inwards posteriorly; postmedial line crenulate, approaching the medial line at inner margin; subterminal line indistinct, bordered by a reddish brown triangular spot below apex and a larger spot on the inner margin. Hindwing similar to forewing; antemedial line almost straight; two reddish brown spots smaller. Underside greyish brown; medial and postmedial lines ill-defined on forewing, well-defined on hindwing.

Length of forewing. ♂ 29 mm, ♀ 29 mm.

Male genitalia (Fig. 27). Medial plate of gnathos slightly narrowed distally, roundish at apex; ampulla placed nearer to the base than to the apex of costa; aedeagus with a small triangular process dorsally; cornutus lacking.

Female genitalia (Fig. 31). Sterigma with median transverse area of some ridges; bursa copulatrix with posterior part very weakly sclerotized, slender, almost parallel-sided, and with anterior part slightly enlarged.

Material examined. 1 ♂, 1 ♀. Sikkim. 1 ♂, labelled “Brijvett, Sikkim/Collectio H. J. Elwes; 1 ♀, labelled “Sikkim, 8. 6. 89, J. G. Pilcher/Rothschild Bequest B. M. 1939–1”, in coll. British Museum (N. H.).

Distribution. India, Sikkim.

Remarks. This species is easily distinguished from other species of *Calicha* dealt with in this paper by much larger size.

***Calicha ornataria ornataria* (LEECH)**

(Figs. 5, 6)

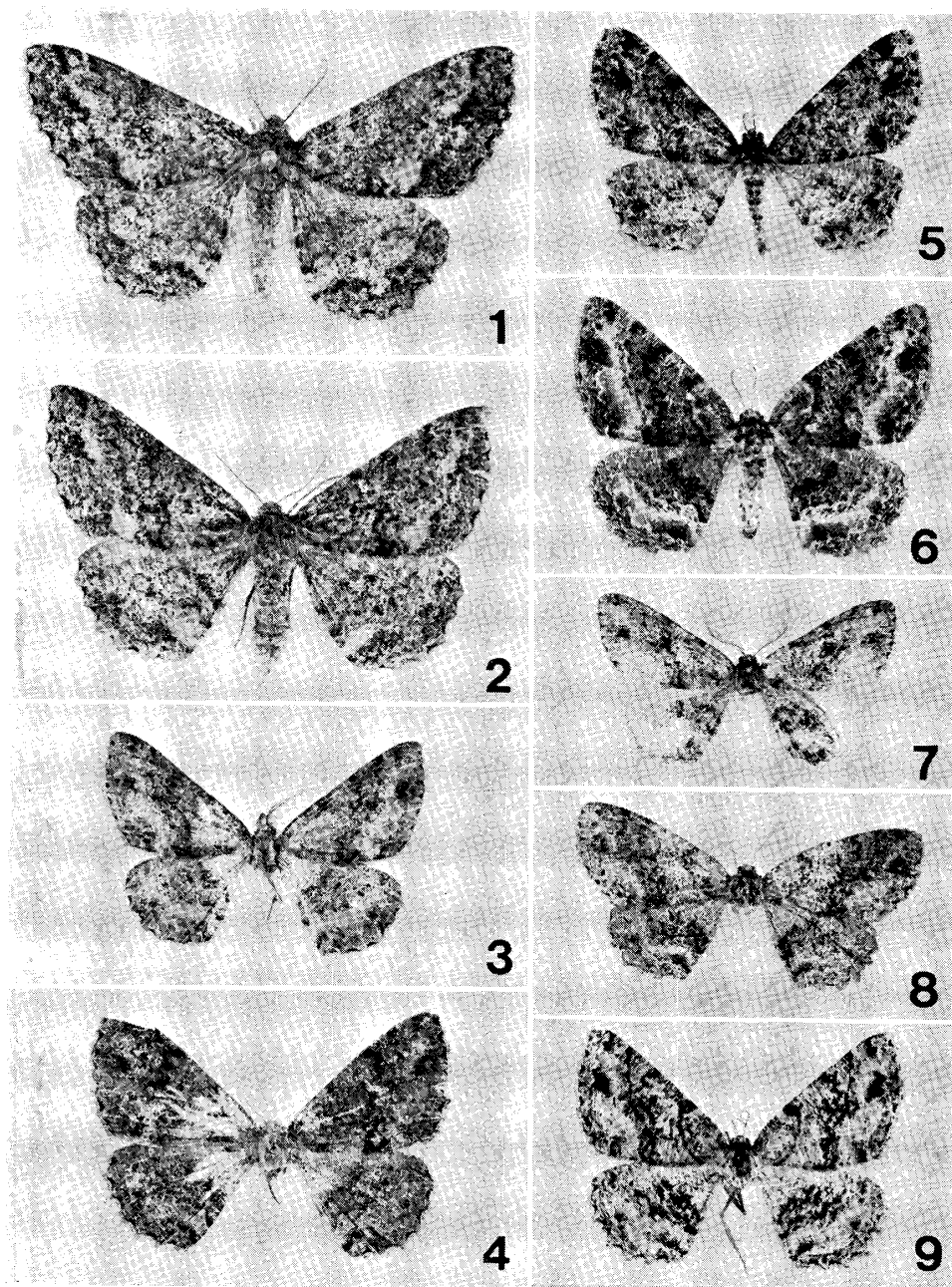
Boarmia ornataria LEECH, 1891: 45; LEECH, 1897: 417; MATSUMURA, 1905: 160; PROUT, 1915: 376, pl. 21: h; WEHRLI, 1943: 522.

Boarmia (Calicha) ornataria: PROUT, 1930: 331.

Calicha ornataria: INOUE, 1953: 15; INOUE, 1956: 328; INOUE, 1957: 259, pl. 52: 1365; INOUE, 1959: 212, pl. 149: 3; INOUE, 1977: 298.

Boarmia ornataria var. *inornataria* LEECH, 1891: 46 (invalid).

Similar to *retrahens* in colour and maculation, but readily distinguished from it as follows: much smaller; subterminal line bordered by a reddish brown shade, which is not divided into two spots and preceded by a yellowish shade; lines of underside of wings more inconspicuous.



Figs. 1-9. *Calicha* spp. 1-2. *C. retrahens* MOORE. 1: ♂, Sikkim. 2: ♀, Sikkim. In British Museum (N.H.). 3-4. *C. griseoviridata* (WILEMAN). 3: ♂, Taiwan, Puli. 4: ♀, Taiwan, Puli. In coll H. INOUE. 5-6. *C. ornataria ornataria* (LEECH). 5: ♂, Japan, Nagano. 6: ♀, Japan, Aomori. 7-9. *C. nooraria* (BREMER). 7: ♂, paratype of *chosenicola*, Korea, Shuotsu. 8: ♀, holotype of *chosenicola*, Korea, Shuotsu. Both in Naturhistoriska Riksmuseet. 9: ♀, USSR, S. Ussuri.

Length of forewing. Vernal brood ♂ 22-23 mm, ♀ 24-25 mm; aestival brood ♂ 18-21 mm, ♀ 19-23 mm.

Male genitalia (Fig. 28). Similar to those of *retrahens*, differing mainly as follows: medial plate of gnathos broader, almost truncate at apex; valva shorter, distinctly narrowed distally; ampulla larger with stouter spines; aedeagus with a short pointed process dorsally and 6-12 spines of varying length on vesica.

Female genitalia (Fig. 32). Distinct from *retrahens* as follows: sterigma with median area much smaller, sometimes almost reduced; bursa copulatrix with posterior part more strongly sclerotized, much shorter, gradually broadened anteriorly, and with anterior part strongly enlarged, sometimes a little concave at near middle portion.

Material examined. 11 ♂, 16 ♀. Japan. Hokkaido—Kushiro, Shibeche (vii, viii), Mt. Hakodateyama (vi), Hakodate, Kikyôcho (vii). Honshu—Aomori Pref.: Noheji, Mt. Eboshi (vii). Iwate Pref.: Mt. Hayachine (vii). Akita Pref.: Kazuno, Tashirotai (vii). Gunma Pref.: Doai (vii, emerged). Niigata Pref.: Shibata, Akadani (viii, emerged), Yuzawa (viii, ix, emerged), Myôkô, Tsubame (vii). Yamanashi Pref.: Akiyama (v). Nagano Pref.: Yunomaru (vii). Gifu Pref.: Tokuyama, Shiratani (v). USSR. Kunashiri—Mendelejevo, 1 ♀, 18. vii. 1974 (KIRPITSNIKOVA), in coll. J. VIIDALEPP.

I examined one female specimen labelled “Japan, Karinzawa [=Karuizawa], Ida Trotzig” preserved in Naturhistoriska Riksmuseet, Stockholm.

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu), Kuriles (Kunashiri), Korea, China.

Mature larva (Fig. 21). Colour pattern and external characters were described and illustrated by me (1969).

Ecological notes. Host plants: *Euonymus alatus* f. *striatus*, *E. sieboldianus* (SATO, 1969) (Celastraceae). Larvae hatched from eggs laid by a captured females were successfully reared on *E. japonicus* and *Celastrus orbiculatus* (Celastraceae) as well as the preceding plants. Bivoltine in warmer region, and probably univoltine in colder region. Hibernation takes in the pupal stage.

Remarks. This species is the only representative of *Calicha* in Japan. PROUT (1915) mentions that this species may probably be a form of *retrahens*, but it is clearly a good species as described above. I had a good opportunity to examine BRYK's type-series of *chosenicola*, described as Korean subspecies of this species. The holotype (♀), allotype (completely destroyed and all parts missing leaving both hindwings in capsule) and one paratype (♂) are correctly identical with the next species.

Calicha ornataria yangtseina (WEHRLI), **comb. nov.**

Boarmia ornataria yangtseina WEHRLI, 1943: 523.

WEHRLI (1943) described *yangtseina* from Likiang, Prov. Nord-Yuennan, West China as a subspecies of *C. ornataria* (LEECH) based on the material collected by Dr. H. HÖNE. I have not yet had an opportunity to examine this subspecies. WEHRLI's original description as follows: “—, ferner auf Likiang, Prov. Nord-Yuennan (Dr. HÖNE), in einer lebhafter und kontrastreicher gefärbten Form der Juli-Brut mit besser gezeichneten schärferen Linien, mit tiefschwarzen Flecken im Aussenfeld beider Flügel zwischen Ader III, 1 und III, 2, sowie vor dem Hinterwinkel, mit einem ockrigen Streif längs der Ader III, 1, vor dem Ird und der Subterminalen beider Flügel, schwächer auch an der Mittelader der Vflgl.”

Distribution. West China (Likiang).

***Calicha nooraria* (BREMER)**

(Figs. 7–9)

Boarmia nooraria BREMER, 1864: 75, pl. 6: 20; STAUDINGER, 1897: 53; STAUDINGER, 1901: 340; WEHRLI, 1929: 26; WEHRLI, 1943: 523.

Deileptenia nooraria: MEYRICK, 1892: 105.

Boarmia (*Cleora*) *nooraria*: PROUT, 1915: 368, pl. 25: g.

Calicha nooraria: INOUE, 1953: 16.

Boarmia ornataria nigrisignata WEHRLI, 1927: 98, pl. 11: 37.

Boarmia (*Calicha*) *ornataria chosenicola* BRYK, 1948: 208, **syn. nov.**

Closely related to *ornataria*, but differing from it mainly as follows. Both wings not tinged with olive; lines more defined; subterminal line broadly bordered by a reddish shade, which is not tinged with yellow.

Length of forewing. ♂ 17–18 mm, ♀ 20–21 mm.

Male genitalia (Fig. 29). Similar to those of *ornataria*, differing from it as follows: uncus slightly shorter; medial plate of gnathos narrowed towards apex; valva slenderer, ampulla smaller, situated nearer to the apex than to the base of costa, covered with a lesser number of spines; juxta with arms much longer, basal part smaller.

Female genitalia (Fig. 33). Sterigma with median area, similar to that of *retrahens*, slightly rounded anteriorly, without prominent ridges; bursa copulatrix with posterior part sclerotized as in *ornataria*, almost parallel-sided as in *retrahens*, and anterior part enlarged.

Material examined. 2 ♂, 3 ♀. Korea. 1 ♀, holotype of *chosenicola*, labelled “Korea, Shuotsu, 1935, Sten Bergman”; 1 ♂, paratype of *chosenicola*, labelled as holotype, in coll. Naturhistoriska Riksmuseet, Stockholm. 1 ♀, Kyonggi-do, Bogwargsa, 19. vii. 1977 (ex. H. KEZUKA), in coll. H. INOUE. USSR. 1 ♂, S. Ussuri, Kangauz, 26. vi. 1974; 1 ♀, S. Ussuri, Gornotajozhnaja, 11–15. vii. 1979 (J. VIIDALEPP).

Distribution. Korea, Ussuri.

Remarks. Some doubt had been entertained as to specific independence of this species until INOUE (1953) made it a good species on the basis of his study of the male genitalic structure. The allotype of BRYK’s *chosenicola*, labelled as holotype, had been totally destroyed and only both hindwings were preserved in capsule. I could identify it with this species by the characteristic markings of the wing.

Calicha griseoviridata* (WILEMAN), **comb. nov.*

(Figs. 3–4)

Boarmia griseoviridata WILEMAN, 1911: 295; PROUT, 1914: 269.

Similar to *nooraria* in colouration, but larger in size and differing as follows: lines less-defined; a reddish shade bordering subterminal line less-developed, especially in male.

Length of forewing. ♂ 22 mm, ♀ 24 mm.

Male genitalia (Fig. 30). Gnathos as in *nooraria*; valva similar to that of *nooraria*, with larger ampulla bearing much more spines and also with many spines ventrad of ampulla; juxta with arms shorter and broader, the basal part as in *ornataria*; aedeagus with about six spines on vesica, spines much longer than those of *ornataria* or *nooraria*.

Female genitalia (Fig. 34). Similar to those of *nooraria*, differing as follows: sterigma with median area almost straight anteriorly; bursa copulatrix with posterior part much longer, slightly broadened towards ostium.

Material examined. 1 ♂, 1 ♀. Taiwan. 1 ♂, Nantou Hsien, Puli, 1958; 1 ♀, Nantou Hsien, Wushe, 1966, in coll. H. INOUE.

Distribution. Taiwan.

Remarks. This species was described based on two males and one female from "Kanshirei" [=Kuantyling] by WILEMAN (1911). When PROUT (1914) recorded one male of this species from "Suisharyo" [=Shuisheliao], he considered the species of MEYRICK's (1892) *Diastictis* as *Boarmia* and those of MEYRICK's *Selidosema* as *Alcis*, and provisionally placed this species in *Boarmia*.

Microcalicha gen. nov.

Type-species. *Boarmia fumosaria* LEECH, 1891: 44.

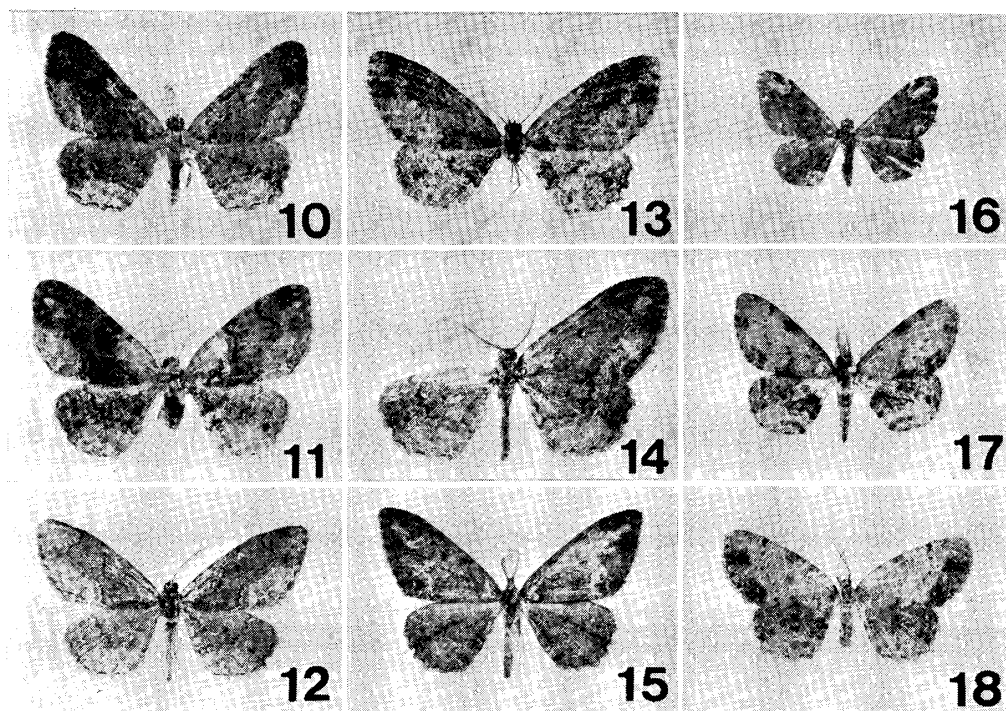
Similar to *Calicha* in external characters except for highly developed proboscis and larger hair-pencil of male hind tibia.

Male genitalia (Figs. 38–43). Uncus short, pointed at apex. Tegumen broad, slightly produced caudad. Gnathos developed, medial plate narrowly rounded at apex. Valva broad with costa broadly sclerotized. Ampulla arising from near the middle of costa, different in shape according to species, not covered with spines. Juxta narrowed between base and apex, without arms. Aedeagus slender, with a single thorn-like cornutus on vesica.

Female genitalia (Figs. 35–37). Ovipositor relatively short. Sterigma developed, different in shape according to species. Ostium bursae slender and membranous. Bursa copulatrix weakly sclerotized and ribbed posteriorly. A single signum, similar in shape to *Calicha*, in anterior small sac. Ductus seminalis arising from near posterior end of bursa copulatrix.

First instar larva. In pigmental pattern quite distinct from *Boarmia*, agreeing with *Calicha*.

Remarks. This new genus contains *fumosaria* LEECH and *sordida* BUTLER from Japan, *minima* WARREN from India and probably some other species from China. Adult and larval characters suggest it to be more closely related to *Calicha* than to *Boarmia*, in which *fumosaria* and *sordida* have long been placed. It is quite distinct from *Boarmia* by the following points, to say nothing of some remarkable structural differences in male and female genitalia: pectinations of male antenna unscaled dorsally, arising from base of the segment, while in *Boarmia* fully scaled dorsally, arising from distal end of the segment; pigmental pattern of first instar larva not "Boarmia-type" (named by SATO, 1980); cuticle of mature larva almost smooth, body setae pointed at apex, while in *Boarmia* cuticle strongly granulate and in most species body setae truncate at apex. Superficially it resembles *Calicha* and quite agrees with it in pigmental pattern of first instar larva, but markedly different from it in male and female genitalia.



Figs. 10–18. *Microcalicha* spp. 10–12. *M. fumosaria fumosaria* (LEECH). 10: ♂, Japan, Tokyo. 11: ♀, Japan, Niigata. 12: ♂, Japan, “Shinano.” In British Museum (N.H.). 13–14. *M. f. tchraparia* (OBERTHÜR). 13: ♂, West China, Tâ-tsien-lou. 14: ♂, West China, Siao-lou. Both in British Museum (N.H.). 15. *M. f. fulvifusa* ssp. nov. ♂, paratype, Taiwan, Alishan. In coll. H. Inoue. 16. *M. minima minima* (WARREN). ♂, India, Khasis. In British Museum (N.H.). 17–18. *M. sordida* (BUTLER). 17: ♂, Japan, Is. Tsushima. 18: ♀, Japan, Iwate.

***Microcalicha fumosaria fumosaria* (LEECH), comb. nov.**

(Figs. 10–12)

Boarmia fumosaria LEECH, 1891: 44; LEECH, 1897: 417; pl. 7: 5; MATSUMURA, 1905: 160; INOUE, 1956: 326; INOUE, 1957: 258, pl. 51: 1359; INOUE, 1959: 211, pl. 148: 6; INOUE, 1977: 297.

Boarmia (*Boarmia*) *fumosaria*: PROUT, 1915: 375, pl. 21: f; WEHRLI, 1943: 521.

Forewing black, tinged with ochreous proximad of antemedial line and distad of postmedial line; antemedial line excurved anteriorly; medial line almost vanished; postmedial line strongly excurved near veins M_1 and M_2 , and then runs parallel with outer margin; discal spot black, usually conspicuous; subterminal line inconspicuous. Hindwing similar to forewing, differing in basal ochreous area much smaller and medial line sometimes present posteriorly. Underside fuscous; discal spot distinct; other maculation of upperside very weakly represented.

Length of forewing. ♂ 16–19 mm, ♀ 19–21 mm.

Male genitalia (Fig. 38). Medial plate of gnathos about 1.5 times as long as the basal width; costa gradually broadened towards apex; ampulla very long and slender, arising from middle of costa, strongly bent ventrad, extending dorsally near the base of costa, ending in a minute tip; juxta rugulose dorsally; aedeagus shorter than the combined length of tegumen and saccus; cornutus thorn-like in shape.

Female genitalia (Fig. 35–36). Medial area of sterigma elliptical, produced a

minute triangular process posteriorly, and lateral area narrowly sclerotized; bursa copulatrix with a membranous pouch at the right side of posterior end, and with posterior sclerotized and ribbing part long and slender; ductus seminalis arising from the pouch; signum with two or more short spines.

Material examined. 5 ♂, 5 ♀. Japan. Hokkaido—Bibai (viii). Honshu—Niigata Pref.: Myôkô, Akakura (vii, emerged); Myôkô, Tsubame (vii, emerged); Is. Sado, Mt. Megami (vii). Tokyo: Nippara (vi). Nagano Pref.: Togakushi (viii). Gifu Pref.: Kurumijima (viii). Korea. Cheju-do, Mt. Hanla, Tamlakekog alt 1200 m (viii).

I also examined two male specimens (fig. 12) from Japan, labelled “Hot sprg. Hoppo, Prov. Shinano [=Nagano Pref.], 25. vii. [19]22, I. Sugitani/Joicey Bequest, Brit. Mus. 1934-120”, preserved in British Museum (N.H.).

Distribution. Japan (Hokkaido, Honshu, Shikoku); Korea (new record).

Mature larva (Fig. 22). Length about 32–36 mm. Head: vertex almost rounded; seta P1 slightly mesad of P2, almost level with AF2; the ratio of width to length of head about 1.4; ocelli 3 and 4 larger than the others; ocelli 1 to 5 almost evenly spaced, 5 separated from 6 by about twice as long as the diameter of 5. Mouth parts: labral emargination about 0.5, seta M2 slightly below level of M1, seta L1 distinctly above level of L2; mandible with 8 distal teeth, lateral and internal tooth lacking; spinneret about 1.5 times as long as the basal width, with parallel sides, the apex extending to the apical segment of labial palpus. Body: cuticle almost smooth; seta short and pointed, almost flush with skin; ventral and anal prolegs each with 35–37 and 37–39 crochets, arranged in a complete mesoseries. In other points of structure general characteristics of boarmid genera are exhibited. Colour pattern: head reddish brown; body deep green, sometimes tinged with pink on dorsum and spiracular region; spiracle white with a black rim; legs and anal shield concolorous with body, sometimes the former tinged with pink and the latter maringed with pink.

Material examined. 4 exs. Japan. Honshu—Niigata Pref.: 2 exs. feeding on *Euonymus alatus* f. *striatus*, Myôkô, Akakura, 27. vi. 1970; 2 exs. on *E. sieboldianus*, Myôkô, Tsubame, 26. vi. 1970 (R. SATO).

Ecological notes. Host plants: *Euonymus japonicus* (KUMAKURA, 1956), *E. alatus* f. *striatus*, *E. sieboldianus*, *E. oxyphyllus* (SATO, 1970) (Celastraceae). Bivoltine in warmer regions and univoltine in colder regions. Hibernation in pupal stage.

Remarks. This species was described by LEECH (1891) based on ten specimens from Yokohama and Oiwake in Japan. Later STERNECK (1928) recorded a pair of specimens from Ta-tsien-lou and Kwanhsien in West China. WEHRLI (1943) pointed out that STERNECK's specimens are not identical with *fumosaria*, but with *tchraparia*, which had been described by OBERTHÜR (1894) from Ta-tsien-lou as a *Hemelophila*. PROUT (1915) provisionally placed *tchraparia* in *Boarmia* and placed it next to *fumosaria*. My close examination of male genitalia of *tchraparia* revealed that it is structurally identical with *fumosaria*. On the other hand, BASTELBERGER (1909) described an aberrant form of *fumosaria* from Taiwan, “ab. *fulvifusa*.” Mr. FLETCHER and Dr. INOUE kindly sent me a colour transparency of the holotype and one male specimen from Taiwan on loan, respectively. The structure of male genitalia clearly shows that “ab. *fulvifusa*” is conspecific with *fumosaria*. As some differences in colour and macula-

tion among *fumosaria*, *tchraparia* and “*ab. fulvifusa*” can be found, each of them will be treated as a subspecies.

***Microcalicha fumosaria tchraparia* (OBERTHÜR), comb. & stat. nov.**
(Figs. 13–14)

Hemelophila tchraparia OBERTHÜR, 1894: 25, pl. 5: 63.

Hemelophila (?) *tachraparia*: LEECH, 1897: 432 (misspelling).

Boarmia (*Boarmia*) *tchraparia*: PROUT, 1915: 375, pl. 21: f (as *tschraparia*); WEHRLI, 1943: 522.

Boarmia fumosaria: STERNECK, 1928: 221, pl. 4: 44.

Similar to the nominate subspecies, differing as follows: forewing a little more rounded distally; ground colour of wings lighter, weakly suffused with black medially.

Length of forewing. ♂ 17–19 mm.

Male genitalia (Figs. 40–41). Similar to those of the nominate subspecies, but medial plate of gnathos smaller, and cucullus more rounded distally.

Female genitalia. Not examined.

Material examined. 2 ♂. West China. 1 ♂, labelled “Tä-tsien-Lou, 1898, Chassurs indigènes/Ex Oberthür Coll. Brit. Mus. 1927–3/*Boarmia tchraparia* Oberthür, det. D. S. Fletcher, 1980”; 1 ♂, labelled “Siao-Loû, 1903, Chassurs Indigènes du P. Déjean/Ex Oberthür Coll. Brit. Mus. 1927–3”, in coll. British Museum (N. H.).

Distribution. West China.

***Microcalicha fumosaria fulvifusa* ssp. nov.**
(Figs. 15 & 19)

Calicha fumosaria ab. fulvifusa BASTELBERGER, 1909: 179 (unavailable).

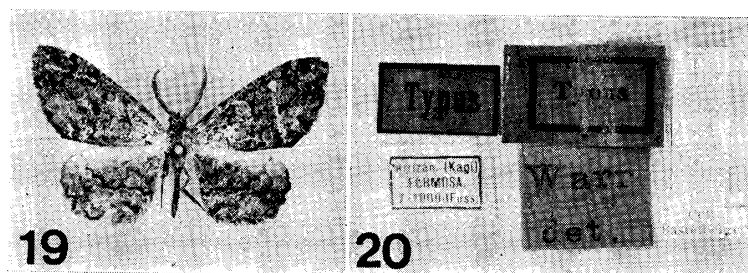
Different from the nominate subspecies and *tchraparia* mainly as follows: forewing narrower distally; ground colour of wings much darker, outer area reddish brown, not tinged with ochreous.

Male genitalia (Fig. 39). Similar to those of the nominate subspecies, but medial plate of gnathos as in *tchraparia*.

Female genitalia. Not examined.

Length of forewing. ♂ 17 mm.

Holotype. ♂, Taiwan—labelled “Arrizan [=Alishan], (Kagi), FORMOSA, 7–10000 Fuss/Typus/T. 148, W8/Coll. Bastelberger/Warr. det”, in coll. Senckenberg Museum, Frankfurt a. Main, West Germany.



Figs. 19–20. *Microcalicha fumosaria fulvifusa* ssp. nov. 19. Holotype, ♂, Taiwan, Alishan. 20. Labels of holotype. In Senckenberg Museum. Photographs by Mr. D. S. FLETCHER.

Paratype. ♂, Taiwan—Chiai Hsien, Alishan, ix. 1964 (Y. I. CHU), in coll. H. INOUE.

Distribution. Taiwan.

Remarks. *Calicha fumosaria* ab. *fulvifusa* BASTELBERGER, 1909: 179, is not available as a subspecific name under the International Code of Zoological Nomenclature. I have not examined the holotype: the identification was made by means of a colour transparency of the holotype, kindly furnished by Mr. D. S. FLETCHER.

***Microcalicha minima minima* (WARREN), comb. nov.**

(Fig. 16)

Calicha (?) *minima* WARREN, 1896: 132.

Closely related to *fumosaria*, but much smaller in size and differing mainly as follows. Pectinations of male antenna shorter; ground colour of wings fuscous ochreous, slightly tinged with pink; forewing with an elongate pinkish ochreous blotch near apex.

Length of forewing. ♂ 11–12 mm.

Male genitalia (Fig. 42). Similar to those of *fumosaria*, especially in the shape of ampulla, but different from it as follows. Uncus more elongate; medial plate of gnathos smaller; valva much slenderer; ampulla extending dorsad well beyond the costal margin of valva; cornutus longer and slenderer.

Female genitalia. Not examined.

Material examined. 2 ♂. India. 1 ♂, labelled “Khasis, Nat. Coll./Ex Oberthür Coll. Brit. Mus. 1927–3”; 1 ♂, labelled “6305, Khasia Hills/Swinhoe Coll. Brit. Mus. 1926–239”, in coll. British Museum (N.H.).

Mature larva. External characters and colour pattern of alcoholic specimens were described by SINGH (1951).

Ecological notes. Host plants: *Elaeodendron glaucum* (Celastraceae), *Ehretia acuminata* (Braginaceae). Larvae appear in January, March and November at Dehra Dun in India (SINGH, 1951).

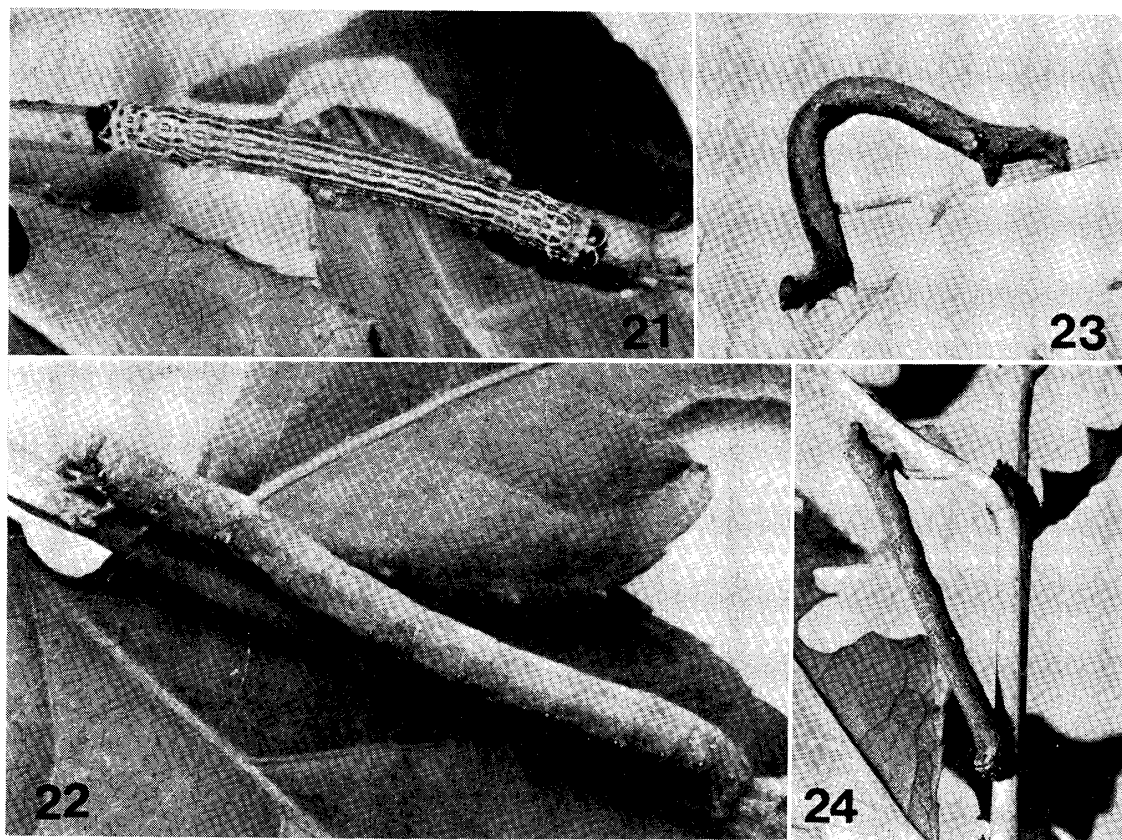
Remarks. When WARREN (1896) described his new species, based on a male from Khasias, India, he placed it in *Calicha* from its venation. However, he put a question mark after the generic name as he thought that it was hardly congeneric with *C. retrahens*.

***Microcalicha minima praeoptata* (PROUT), comb. nov.**

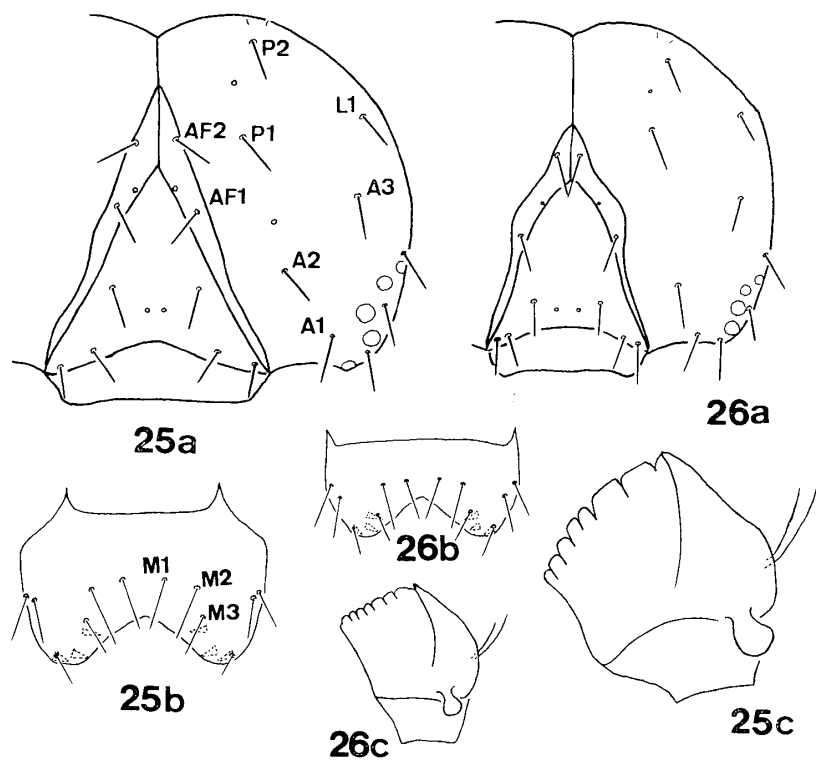
Boarmia (*Calicha*) *minima praeoptata* PROUT, 1932: 106.

Boarmia minima praeoptata: HOLLOWAY, 1976: 82, fig. 635 (♂ genitalia).

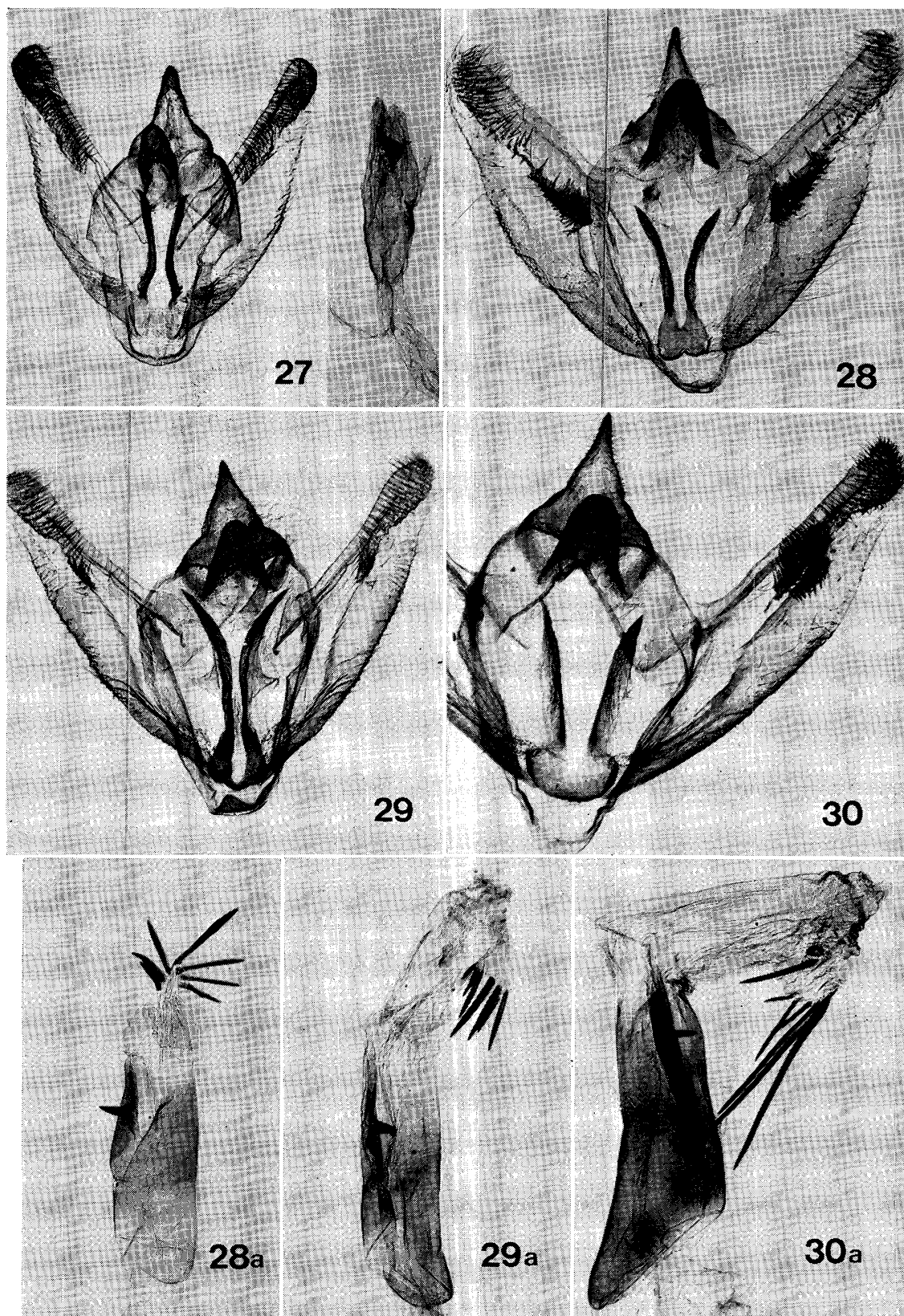
PROUT (1932) described *praeoptata* based on four females from Mt. Kinabalu, Borneo, as a subspecies of *minima*. I have not had a chance to examine this subspecies. Original description by PROUT (1932) as follows: “♀, 30–36 mm, larger than *m. minima* Warr. (1896, Khasis); hindwing above with the posterior brown patch larger, reaching or almost reaching R_3 ; forewing beneath with postmedian line expanded into a triangle at costa, here (and slightly further hindward) accompanied distally by an ill-defined



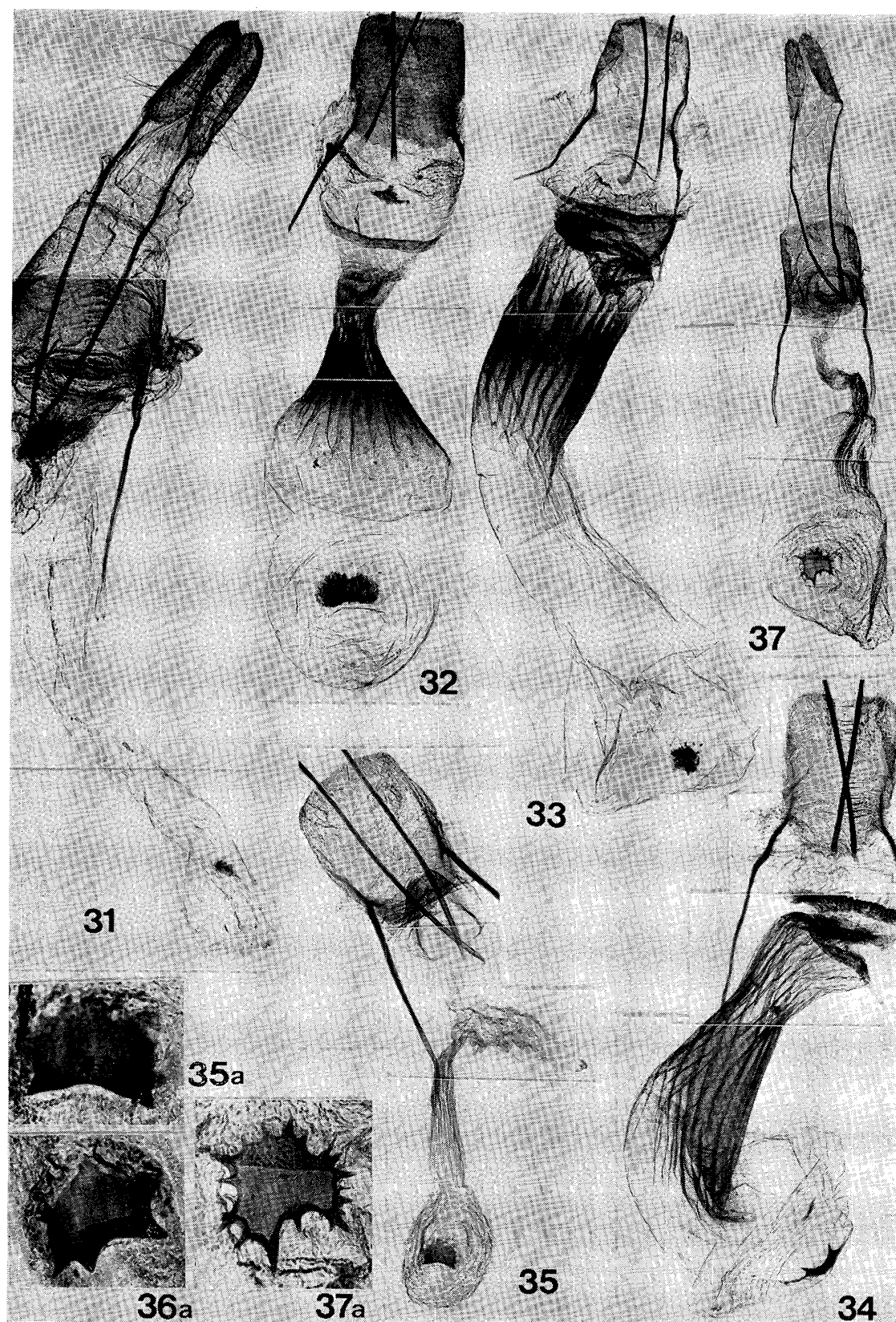
Figs. 21-24. Mature larvae. 21. *Calicha ornataria ornataria* (LEECH). 22. *Microcalicha fumosaria fumosaria* (LEECH). 23-24. *M. sordida* (BUTLER).



Figs. 25-26. Mature larvae of *Microcalicha* spp. 25. *M. fumosaria fumosaria* (LEECH). 26. *M. sordida* (BUTLER). a: head. b: labrum. c: mandible.



Figs. 27-30. Male genitalia of *Calicha* spp. 27. *C. retrahens* MOORE. In British Museum (N.H.). 28. *C. ornataria ornataria* (LEECH). Slide RS-291. 29. *C. nooraria* (BREMER). RS-1281. 30. *C. griseoviridata* (WILEMAN). In coll. H. INOUE. a: aedeagus.



Figs. 31-34. Female genitalia of *Calicha* spp. 31. *C. retrahens* MOORE. In British Museum (N.H.). 32. *C. ornataria ornataria* (LEECH). Slide RS-1175. 33. *C. nooraria* (BREMER). RS-1280. 34. *C. griseoviridata* (WILEMAN). In coll. H. INOUE.
 Figs. 35-37. Female genitalia of *Microcalicha* spp. 35. *M. fumosaria fumosaria* (LEECH). RS-1177. 36. Ditto. RS-932. 37. *M. sordida* (BUTLER). RS-934. a: signum.

pale, buff-tinged patch.”

Male genitalia. Illustrated by HOLLOWAY (1976). No difference from the nominate race.

Distribution. Borneo.

***Microcalicha sordida* (BUTLER), comb. nov.**

(Figs. 17–18)

Selidosema sordida BUTLER, 1878: 406; BUTLER, 1879: 46, pl. 52: 7; MATSUMURA, 1905: 163.

Boarmia (*Boarmia*) *sordida*: PROUT, 1915: 375, pl. 21: f; WEHRLI, 1943: 522.

Boarmia sordida: INOUE, 1956: 326; INOUE, 1957: 258, pl. 51: 1360; INOUE, 1959: 211, pl. 148: 5; INOUE, 1977: 297.

Boarmia catotaeniaria tomarmia BRYK, 1942: 84, pl. 2: 20 (♀).

Boarmia sordida sordina BRYK, 1942: 85 (♂).

Easily distinguished from *fumosaria* by the following characters. Much smaller in size; wings ochreous, suffused with black medially only on hindwing; forewing with medial line indicated by a small patch at costa, postmedial line more straight, discal spot absent.

Length of forewing. ♂ 13–15 mm, ♀ 14–16 mm.

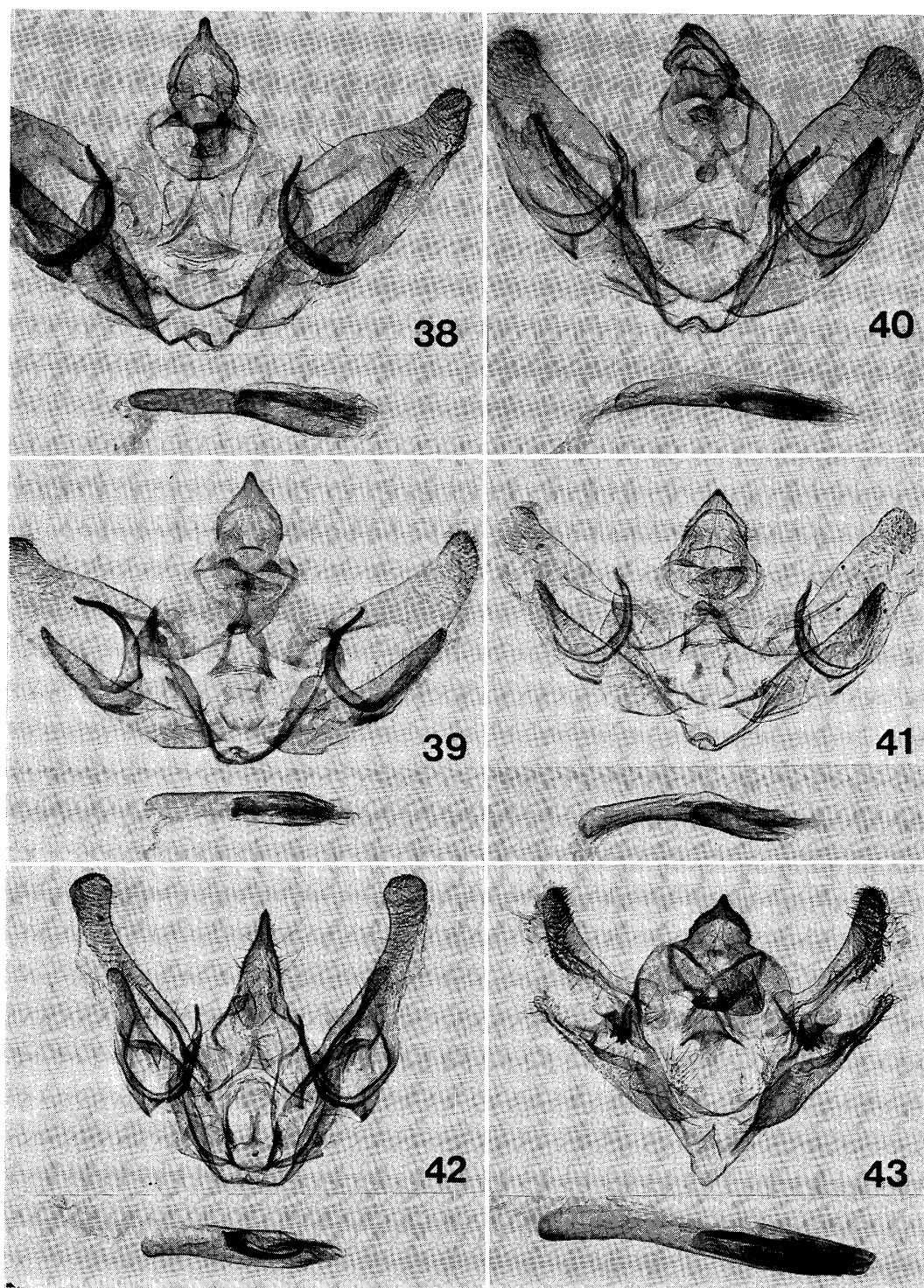
Male genitalia (Fig. 43). Different from those of *fumosaria* as follows: medial plate of gnathos slightly shorter than the basal width; costa narrower; ampulla much smaller, triangular, lined sparsely 4–6 spines along ventral margin of apical portion; juxta almost smooth dorsally; aedeagus longer than the combined length of uncus, tegumen and saccus.

Female genitalia (Fig. 37). Different from those of *fumosaria* as follows: sterigma narrower medially, broader laterally, and surrounding ostium; ostium bursae much longer; bursa copulatrix with caudal sclerotized, ribbing part shorter and broader; signum with 9–12 very short spines.

Material examined. 30 ♂, 14 ♀. Japan. Hokkaido—Ishikari, Morrapu (vii) Kushiro, Shibeche (vii), Hakodate, Gabino (vii). Honshu—Aomori Pref.: Aomori City (viii). Iwate Pref.: Morioka, Tsunagi Spa (vii). Akita Pref.: Chôkai-mura, Hottai Falls (vii); Ôta-machi, Magi Valley (viii). Tokyo: Nippara (vi). Niigata Pref.: Shibata, Akadani (vi, vii); Kanose, Shimodaira (viii); Okutadami (vi); Maki, Kakumi (vi); Shiozawa, Shimizu (viii); Tôkamachi, Mt. Atema (viii, emerged); Yuza-wa, Mt. Naeba (viii, emerged); Myôkô, Sasagamine (vii). Yamanashi Pref.: Momonoki Spa (vi). Wakayama Pref.: Hongû, Ôsugidani (viii). Is. Tsushima—Izuhara, Kamisaka Park (vii); Mine, Mt. Ôboshiyama (vii); Kamitsushima, Mt. Kôraisan (vii). Korea. Mt. Sulaksan, Kojoam alt 500 m (vii); Mt. Sulaksan, Paiktamsa alt 600 m (vi).

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsushima), Kuriles (Kunashiri), Korea.

Mature larva. Length about 25–28 mm. Similar to *fumosaria* in external characters, but distinguished from it by the following points. Head: seta P1 above level of AF2, sometimes slightly above level of the meeting point of coronal and adfrontal sutures; the ratio of width to length of head about 1.2. Mouth parts: labral emargination about 0.4; spinneret longer, about 2.5 times as long as the basal width, the apex extending well beyond the apical segment of labial palpus, but not over the tip of distal



Figs. 38–43. Male genitalia of *Microcalicha* spp. 38. *M. fumosaria fumosaria* (LEECH). Slide RS-1288. 39. *M. f. fulvifusa* ssp. nov. In coll. H. INOUE. 40. *M. f. tchraparia* (OBERTHÜR). 41. Ditto. 42. *M. minima minima* (WARREN). 40–42. In British Museum (N.H.). 43. *M. sordida* (BUTLER). RS-1176.

seta. Body: seta D1 on A8 weakly raised basally; ventral and anal prolegs each with 22–26 and 26–30 crochets, interrupted in the middle. Colour pattern: head reddish brown; vertex, lateral and ocellar region paler; body variable in colour, ranging from

moderate yellow tinged with green to dark red; subdorsal, lateral and supraspiracular lines geminate, wavy, ill-defined; setal base of D1 on A1 to A8 indicated by small black spots; small yellow spot present posterior to spiracle on A1 to A7 and sometimes black markings added posteroventrad of the spot on A6 and A8.

Material examined. 33exs. Japan. Honshu—Niigata Pref.: 5exs. feeding on *Tripterygium wilfordii* var. *regelii*, Myôkô, Tsubame, 5. vii. 1975; 5 exs. on *Celastrus orbiculatus*, Tsunan, Sakasamaki, 20. vii. 1975; 15 exs. on *C. orbiculatus*, Tsunan, Ôwarino, 17. viii. 1978; 8 exs. on *T. wilfordii* var. *regelii*, Shiozawa, Shimizu, 5. viii. 1979 (R. SATO).

I also examined many first instar larvae hatched from eggs of a female taken at Momonoki Spa, Yamanashi Pref. on 16 June, 1979 by me.

Ecological notes. Host plants: *Tripterygium wilfordii* var. *regelii*, *Euonymus alatus* f. *striatus* (SATO, 1971), *Celastrus orbiculatus* (SATO, 1976) (Celastraceae). Bivoltine, probably univoltine in colder regions. Hibernation in pupal stage.

Remarks. BRYK (1942) described *tomarmia* as a subspecies of *Boarmia catotaenaria* (POUJADE) based on one female material from Tomari, Kunashiri, Kuriles. At the same time he also described *sordina* as a subspecies of this species on one male material from the type-locality of *tomarmia*. WEHRLI (1954) pointed out that *tomarmia* is conspecific with *sordida* by judging from the illustration of type-specimen, and that no subspecific differences could be found between *sordina* and the nominate race.

Acknowledgement

I wish to express my cordial thanks to Dr. H. INOUE, Otsuma Woman's University, for his permission to study his materials from Korea and Taiwan and for reading through the manuscript. I am also indebted to Mr. D. S. FLETCHER, British Museum (Natural History), who kindly sent me the invaluable specimens and a transparency of the holotype of *fulvifusa*, on loan. I must also thank Dr. B. GUSTAFSSON, Naturhistoriska Riksmuseet, Stockholm, and Mr. J. VIIDALEPP, Institute of Zoology and Botany, Estonian SSR, USSR, for giving me an opportunity to examine BRYK's type-specimens and Russian materials, respectively. My deep gratitude is expressed to Messrs. I. TATEYAMA, Sapporo, I. KANAZAWA, Kyushu University and Se. YAMANE, Kagoshima University, for their aid in literature survey. My hearty thanks are also due to the following friends for the material of the work: Messrs. N. BITO, K. IJIMA, T. INOKO, A. KASAI, T. KOMATSU, Y. KUSUNOKI, K. SATAKE and M. TAKAHASHI.

References

- BASTELBERGER, M. J., 1909. Beiträge zur Kenntnis der Geometriden-Fauna der Insel Formosa. *Dt. ent. Z. Iris*, **22**: 166–192.
- BREMER, O., 1864. Lepidopteren Ost-Sibiriens. *Mém. Acad. imp. Sci. St. Pétersb.*, (7), **8** (1): 1–103, 8 pls.
- BRYK, F., 1942. Zur Kenntnis der Großschmetterlinge der Kurilen. *Dt. ent. Z. Iris*, **56**: 3–90.
- 1948. Zur Kenntnis der Großschmetterlinge von Korea, Pars II. *Ark. Zool.*, **41** A (1): 153–225.
- BUTLER, A. G., 1878. Descriptions of new species of Heterocera from Japan—Part 3. Geometrites. *Ann. Mag. nat. Hist.*, (5), **1**: 392–419.

- 1879. Illustrations of typical specimens of Lepidoptera Heterocera in the collection of the British Museum. 3. London.
- HAMPSON, G. F., 1895. The fauna of British India, including Ceylon and Burma. Moths 3. 546 pp. London.
- HINTON, H. E., 1946. On the homology and nomenclature of the setae of lepidopterous larvae and some notes on the phylogeny of the Lepidoptera. *Trans. R. ent. Soc. Lond.*, **97**: 1–37.
- HOLLOWAY, J. D., 1976. Moths of Borneo, with special reference to Mount Kinabalu. 264pp. Kuala Lumpur.
- INOUE, H., 1953. Notes on some Japanese Larentiinae and Geometrinae. *Tinea*, **1**: 1–18, pl. 1.
- 1956. Check list of the Lepidoptera of Japan. Part 3. Tokyo.
- 1957. In ESAKI, T., *et al.*, Icones Heterocerorum Japonicorum in Coloribus Naturalibus, [vol. 1]. Osaka.
- 1959. In INOUE, H., *et al.*, Iconographia Insectorum Japonicorum Colore naturali edita, Vol. 1. Tokyo.
- 1977. Catalogue of the Geometridae of Japan (Lepidoptera). *Bull. Fac. domestic Sci. Otsuma Woman's Univ.*, **13**: 227–346.
- KUMAKURA, M., 1956. A list of feeding plants of the Japanese Geometridae, supplement 1. *Insect Ecology*, **5** (12): 102–110. (In Japanese).
- LEECH, J. H., 1891. Descriptions of new species of Geometrae from China, Japan and Corea. *Entomologist*, **24**, Suppl.: 42–56.
- 1897. On Lepidoptera Heterocera from China, Japan and Corea. *Ann. Mag. nat. Hist.*, (6), **19**: 414–463, pls. 6–7.
- MATSUMURA, S., 1905. Catalogus Insectorum Japonicum, **1** (Lepidoptera). Tokyo.
- MEYRICK, E., 1892. On the classification of the Geometridae of the European fauna. *Trans. ent. Soc. Lond.*, **1892**: 53–140.
- MOORE, F., 1888. In HEWITSON & MOORE, Descriptions of new Indian lepidopterous insects from the collection of the late Mr. W. S. ATKINSON, Heterocera continued. Calcutta.
- OBERTHÜR, C., 1894. Descriptions d'insectes nouveaux ou peu connus. *Étud. Ent.*, **18**, 49 pp.
- PROUT, J. B., 1914. H. SAUTER's Formosa-Ausbeute: Geometridae (Lep.). *Ent. Mitt.*, **3** (9): 259–273.
- 1915. In Seitz, Gross-Schmetterlinge der Erde, **4**.
- 1930. On the Japanese Geometridae of the AIGNER collection. *Novit. zool.*, **35**: 289–337.
- 1932. On the Geometridae of Mt. Kinabalu. *J. fed. Malay. St. Mus.*, **17**: 39–111.
- SATO, R., 1969. The larva of *Calicha ornataria* LEECH (Geometridae). *Japan Heterocerists' J.*, (57): 662–665. (In Japanese with English summary).
- 1970. Notes on the larvae of Japanese Geometridae, V. *Yûgato, Niigata*, (41): 59–64. (In Japanese).
- 1971. Notes on the larvae of Japanese Geometridae, IX. *Yûgato, Niigata*, (45): 61–68. (In Japanese).
- 1976. Notes on the larvae of Japanese Geometridae, XXIV. *Yûgato, Niigata*, (63): 29–32. (In Japanese).
- 1980. A revision of the Japanese species of the genus *Ectropis* HÜBNER, with descriptions of two new genera and one new subspecies (Lepidoptera: Geometridae). *Tyô to Ga*, **31**: 29–53.
- SINGH, B., 1951. Immature stages of Indian Lepidoptera (No. 8) Geometridae. *Indian For. Rec. (Ent.) (N. S.)*, **8** (7): 67–158.
- STAUDINGER, O., 1897. Die Geometriden des Amurgebietes. *Dt. ent. Z. Iris*, **10**: 1–122.
- 1901. In STAUDINGER und REBEL, Catalog der Lepidopteren des palaearctischen Faunengebietes Dritte Auflage. Theil **1**: 339–343.
- STERNECK, J., 1928. Die Schmetterlinge der Stötznerschen Ausbeute. Geometridae, Spanner. *Dt. ent. Z. Iris*, **42**: 131–243.
- WARREN, W., 1896. New Geometridae in the Tring Museum. *Novit. zool.*, **3**: 99–148.
- WEHRLI, E., 1927. Horae macrolepidopterologicae Regionis palaearcticae. Volumen **1**: 91–98.
- 1929. Beitrag zur Geometriden-Fauna von Minussinsk, Sibirien, Gouv. Jenissej. *Jahr. Staatsumus. Minussinsk*, **6** (1): 8–30.

WEHRLI, E., 1943. In Seitz, Gross-Schmetterlinge der Erde, Suppl. 4.

——— 1954. In Seitz, Gross-Schmetterlinge der Erde, Suppl. 4. Zusätze und Berichtigungen zu Supplementband 4.

WILEMAN, A. E., 1911. New species of Geometridae from Formosa. *Entomologist*, **44**: 295–297.

摘 要

日本と近隣地域の *Calicha* 属を再検討するとともに、近縁の *Microcalicha* 属を創設した。

Calicha 属は、わが国に *C. ornataria* (LEECH) ソトシロオビエダシヤクのみを産するが、本報では属の模式種である *C. retrahens* MOORE (インド, シッキム) をはじめ、*C. nooraria* (BREMER) (朝鮮, ウスリー), *C. griseoviridata* (WILEMAN) (台湾) も含め、4種を再記載し異同を明らかにした。

Microcalicha 属は、従来 *Boarmia* 属に置かれていた *fumosaria* (LEECH) クロオビモンエダシヤクを模式種として創設された。*Calicha* 属とは、雄触角、脈相が共通である他、属の特徴として重要視される1齢幼虫の斑紋パターンが一致するなど、両属が近縁であることは明らかである。今回扱った *Microcalicha* 属の3種が、いずれも *C. ornataria* と同様にニシキギ科につくことも生態面における共通点として指摘しておきたい。しかし口吻が *Calicha* 属のように短小化していないこと、雌雄交尾器の形態が著しく異なっていることから別属を設定することは妥当であろう。

模式種の他、日本の *M. sordida* (BUTLER) シタクモエダシヤクと、インド・ボルネオの *M. minima* (WARREN) を同属に含めた。中国大陆から記載されている小型の *Boarmia* のうち、いくつかはこの属に含めることができるかもしれない。なお *fumosaria* の近縁種として中国西部から記載された *tchraparia* OBERTHÜR, 異常型として台湾から記載された ab. *fulvifusa* BASTELBERGER は、ともに交尾器形態に種的な差が認められないため、それぞれ亜種として扱うことにした。台湾亜種の学名は、命名規約上、*M. fumosaria fulvifusa* SATO となる。